



[AI-PHI] 7TH SESSION XMAS



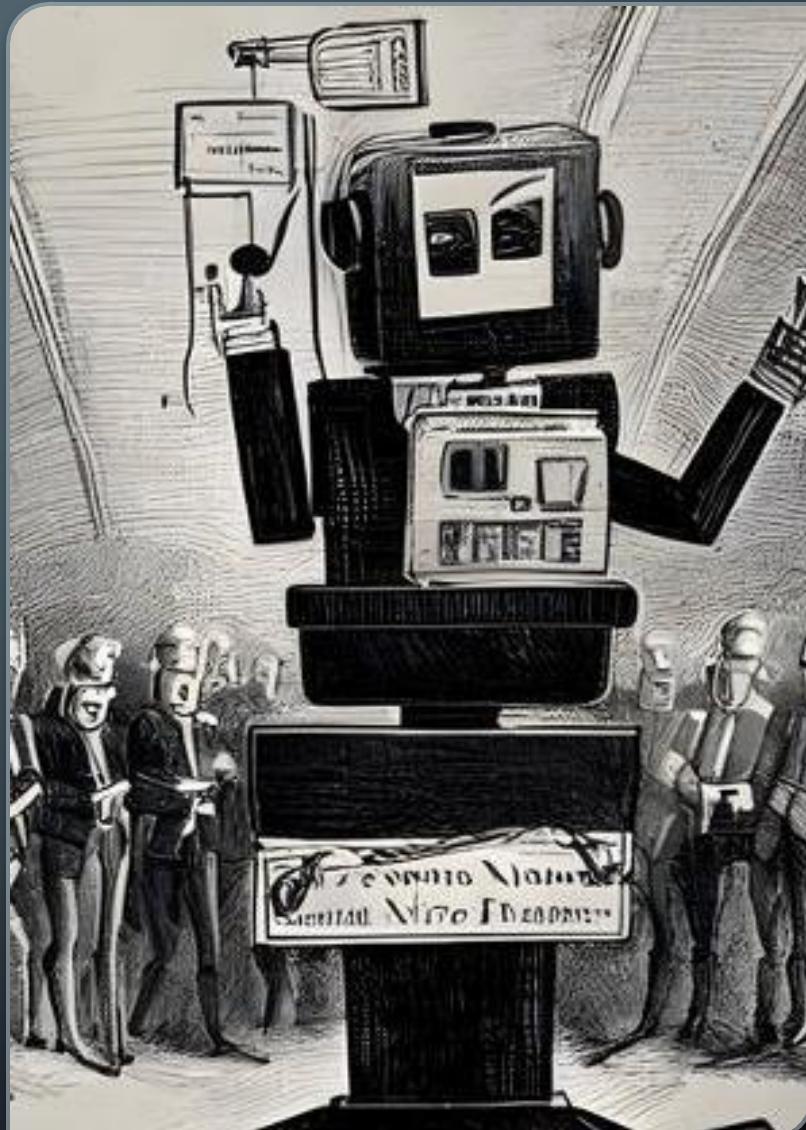
Remote, 21/12/2023

ROUNDT[AI]BLE



FORTN[AI]GHTLY NEWS

1. AI cannot be named as an inventor of patents in the UK
2. Imran Kahn uses voice clone to campaign from behind bars
3. FunSearch: New discoveries in mathematical sciences with LLMs
4. Phi-2: A 2B model that outperforms 13B Llama-2 model
5. MISTRAL - Mixtral 8X7B



FORTN[AI]GHTLY NEWS

"DABUS is a **patented** AI paradigm capable of accommodating trillions of computational neurons within extensive artificial neural systems that emulate the limbo-thalamo-cortical loop within the mammalian brain." Invented by **Dr. Stephen Thaler**

DABUS (**D**evice for the **A**utonomous **B**ootstrapping of **U**nified **S**entience).

Created two novel products — a food container constructed using fractal geometry, which enables rapid reheating, and a flashing beacon for attracting attention in an emergency.

United Kingdom: "An inventor must be a person" - UK supreme court"

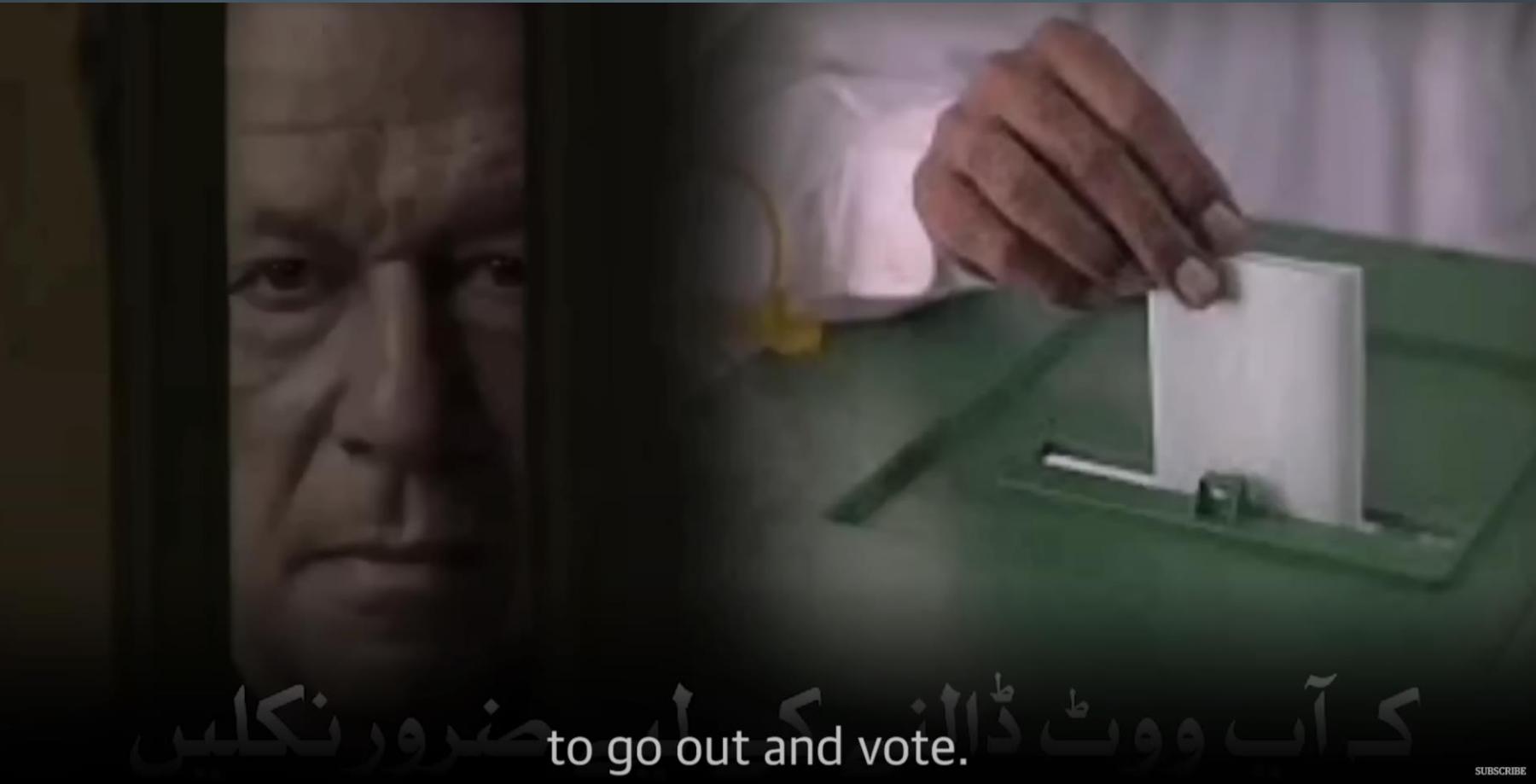
Australia: Initial appeal allowed AI inventor and then was rejected.

European Patent Office: "In the preliminary view of the Board, under the EPC the inventor designated for the purpose of a patent application must be a person having legal capacity."

Germany: AI-generated inventions are patentable, but a natural person must be named as the inventor

New Zealand: Refusing Thaler's patent application because DABUS was named as the inventor.

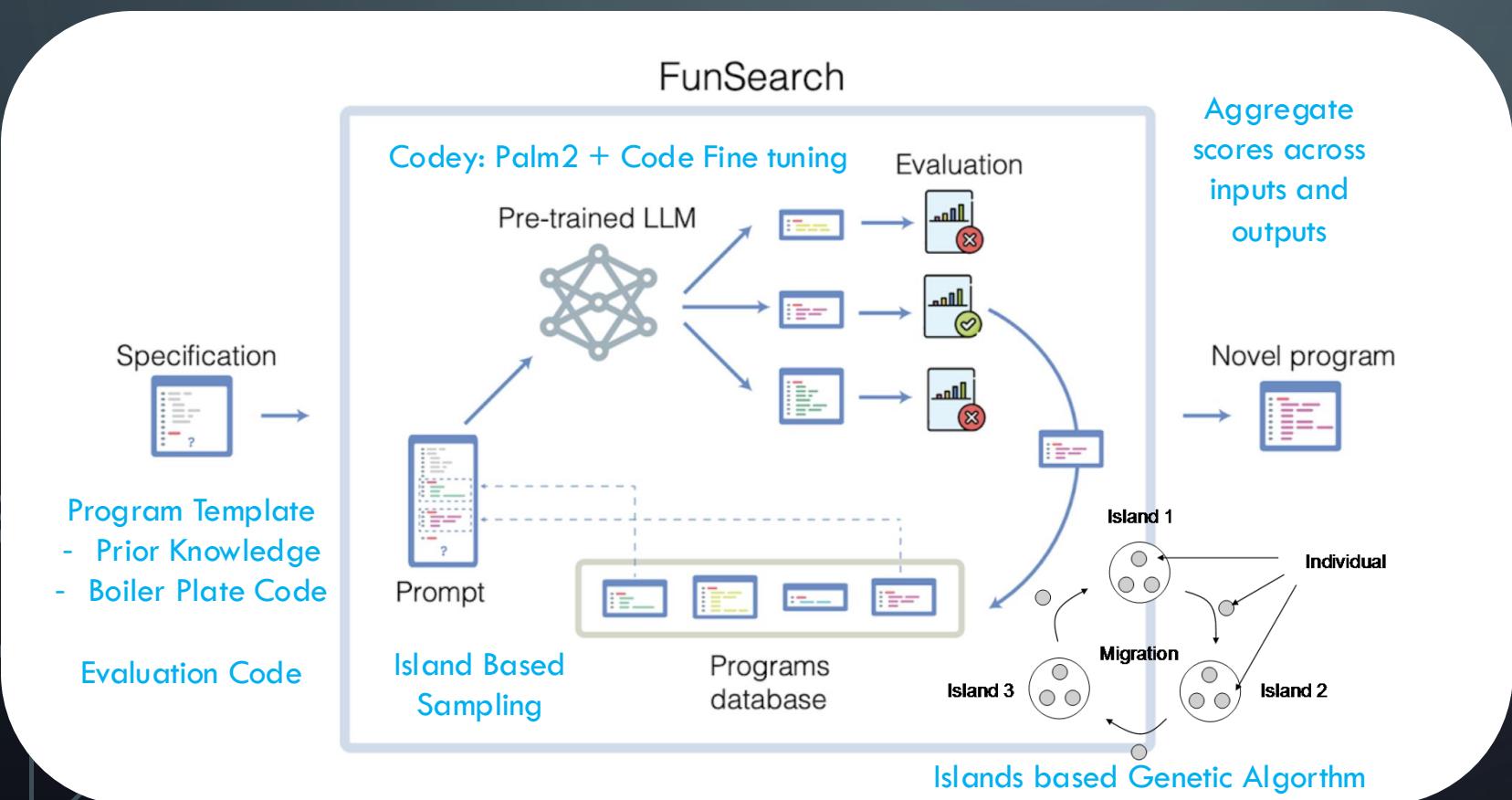
FORTN[AI]GHTLY NEWS



Imran Kahn uses voice clone to campaign from behind bars

FORTN[AI]GHTLY NEWS

FunSearch "Mathematical discoveries from program search with large language models" - Nature



"Largest increase in the size of cap sets in the past 20 years."

"The solutions generated by FunSearch are far conceptually richer than a mere list of numbers. When I study them, I learn something."

JORDAN ELLENBERG, COLLABORATOR AND PROFESSOR OF MATHEMATICS AT THE UNIVERSITY OF WISCONSIN-MADISON

Outperformed established heuristics in bin-packing problem



FORTN[AI]GHTLY NEWS

"Textbooks Are All You Need"
- quality synthetic and real data

Model	Size	BBH	Commonsense Reasoning	Language Understanding	Math	Coding
Llama-2	7B	40.0	62.2	56.7	16.5	21.0
	13B	47.8	65.0	61.9	34.2	25.4
	70B	66.5	69.2	67.6	64.1	38.3
Mistral	7B	57.2	66.4	63.7	46.4	39.4
Phi-2	2.7B	59.2	68.8	62.0	61.1	53.7

Table 1. Averaged performance on grouped benchmarks compared to popular open-source SLMs.

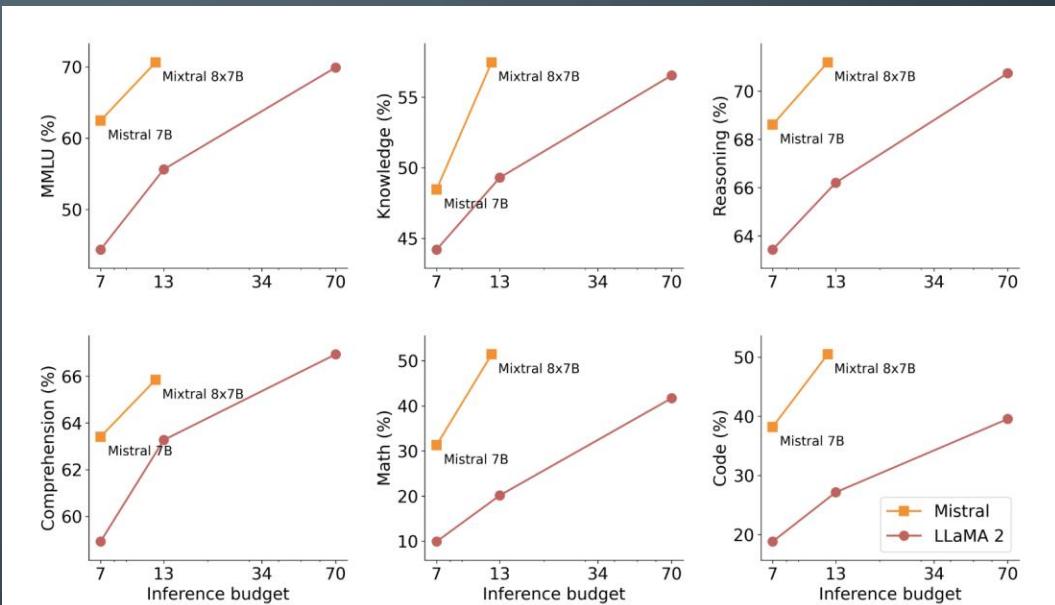
Model	Size	BBH	BoolQ	MBPP	MMLU
Gemini Nano 2	3.2B	42.4	79.3	27.2	55.8
Phi-2	2.7B	59.3	83.3	59.1	56.7

Table 2. Comparison between Phi-2 and Gemini Nano 2 Model on Gemini's reported benchmarks.

Microsoft's Phi-2: A 2B model that outperforms 13B Llama-2 model

FORTN[AI]GHTLY NEWS

	LLaMA 2 70B	GPT - 3.5	Mixtral 8x7B
MMLU (MCQ in 57 subjects)	69.9%	70.0%	70.6%
HellaSwag (10-shot)	87.1%	85.5%	86.7%
ARC Challenge (25-shot)	85.1%	85.2%	85.8%
WinoGrande (5-shot)	83.2%	81.6%	81.2%
MBPP (pass@1)	49.8%	52.2%	60.7%
GSM-8K (5-shot)	53.6%	57.1%	58.4%
MT Bench (for Instruct Models)	6.86	8.32	8.30



Mixtral 8x7B – Mixture of Experts Model (Like GPT4)

SPECIAL ANNOUNCEMENT FROM AI-PHI COMMUNITY

**Awareness in AI (AWAI) a special session of ICAART
conference**

Rome IT,
24-26 February 2024

The aim is to gather people from the same EU call "Awareness Inside" (such as VALAWAI, ASTOUND, etc.) and engage discussions with anyone who is interested on Awareness in AI (implementations, mechanisms, measures, applications, relations with theories of consciousness)

Submissions are due by the 21st of December

<https://icaart.scitevents.org/AWAI.aspx>



CONFERENCE ANNOUNCEMENT

May 29th-31st : Impact of Artificial Consciousness on Society

June 1st: Artificial Consciousness for the General Public (French)



European
Innovation
Council



NEURIPS REPORT



A wide-angle photograph of a poster session in a large convention center. The floor is filled with people looking at numerous research posters displayed on stands. The ceiling features a complex steel truss structure. On the left edge of the image, there is a vertical decorative graphic consisting of white circuit board patterns and small circles.

NEURIPS REPORT

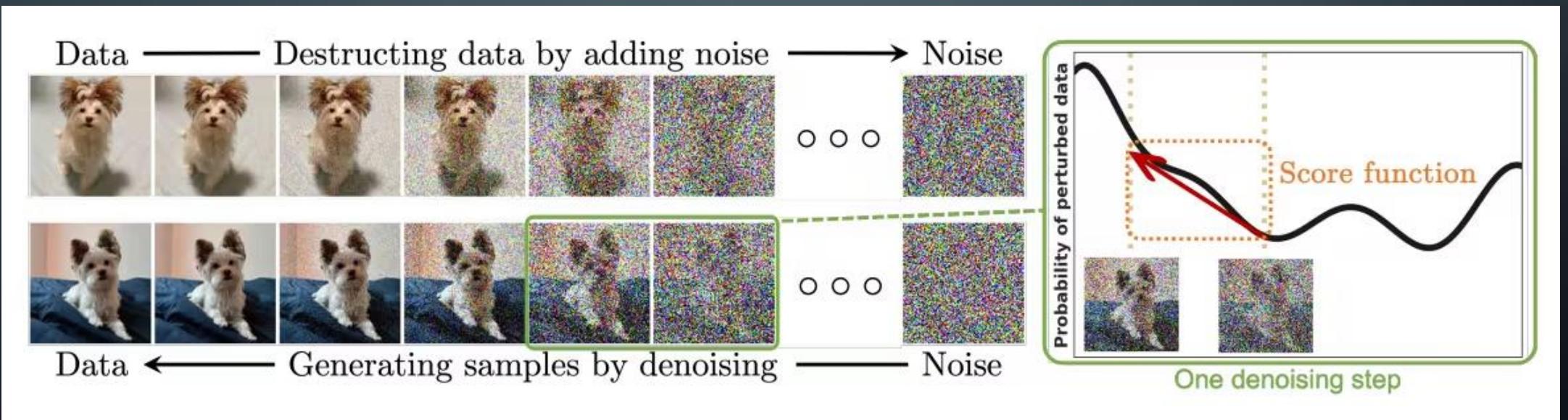
- Poster Session

NEURIPS REPORT - TRENDS

- Diffusion Models
- Large Language Models
- Use of pre-trained models
- Data (curation) is important! E.g., Perplexity Filter
- Self-supervised Learning
- Optimal Transport
- Robots?

NEURIPS REPORT

- Diffusion Models



Discrete Optimization

very
omas Geiping, Tom Goldstein



Breaking Black Box Content Filters

Copyright Photo



PEZ discovered prompt and

Midjourney Generation

Target Style



Learned Hard Prompt + Keyword



Midjourney Bot ✅ BOT.
gasp antioxidantgirl portraitconventions humanrightmigrants tal
5 -

NEURIPS REPORT

- Diffusion Models
- Often using pre-trained models

eNet: Rethinking Cycle Consistency in Guided Diffusion for Image Manipulation

Jia¹, Ziqiao Ma¹, Yicong Huang¹, Honglak Lee^{1,2}, Joyce Chai¹ (*equal contributions)

¹ M CSE COMPUTER SCIENCE AND ENGINEERING UNIVERSITY OF MICHIGAN

² LG AI Research



Cycle consistency is a desirable property in image manipulation, especially in unpaired I2I scenarios as there is no guaranteed correspondence between images in the source and target domains. Gained diffusion models (DMs) are effective in various image editing tasks. Still, it remains an open challenge to adapt them in unpaired I2I translation with a consistency guarantee.

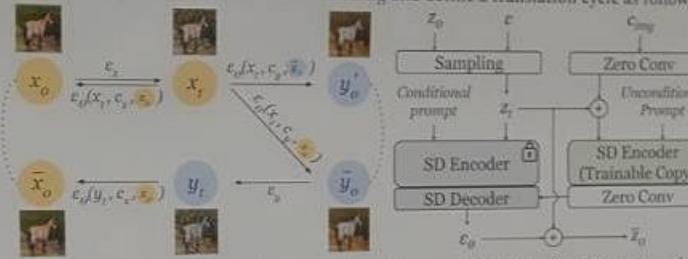
iCups: Editing Object-State Changes

A set of state-level image manipulation that tasks models to edit cups by filling or emptying liquid to/from containers.



CycleNet

CycleNet adopts ControlNet for conditioning and define a translation cycle as follows.



DDPM noted that the forward process allows the sampling of z_t at any time step t using a closed-form sampling function from the source image x_0 :

$$z_t = S(z_0, \varepsilon, t) := \sqrt{\alpha_t} z_0 + \sqrt{1 - \alpha_t} \varepsilon, \quad \varepsilon \sim \mathcal{N}(0, I) \text{ and } t \sim [1, T]$$

The reverse process can be carried out with a network θ that predicts the noise ε . One could estimate the original source image x_0 given a noised latent z_t . Under conditioning, the reconstructed image can be given by:

$$\hat{x}_0 = G(z_t, c_{\text{text}}, c_{\text{img}}) := [z_t - \sqrt{1 - \alpha_t} \varepsilon_\theta(z_t, c_{\text{text}}, c_{\text{img}})] / \sqrt{\alpha_t}$$

With the translation cycle, a set of consistency losses is given by:

$$\mathcal{L}_{x \rightarrow z} = \mathbb{E}_{x_0, z_0} \| \varepsilon_\theta(x_0, c_x, z_0) - z_0 \|_2^2$$

$$\mathcal{L}_{y \rightarrow y} = \mathbb{E}_{x_0, z_0, x_0} \| \varepsilon_\theta(y_0, c_y, \hat{y}_0) - \varepsilon_y \|_2^2$$

$$\mathcal{L}_{x \rightarrow y \rightarrow z} = \mathbb{E}_{x_0, z_0, x_0} \| \varepsilon_\theta(y_0, c_z, x_0) + \varepsilon_\theta(x_0, c_y, x_0) - z_x - \varepsilon_y \|_2^2$$

$$\mathcal{L}_{x \rightarrow y \rightarrow y} = \mathbb{E}_{x_0, z_0} \| \varepsilon_\theta(x_0, c_y, z_0) - \varepsilon_\theta(x_0, c_y, \hat{y}_0) \|_2^2$$

The simplified objective is given by

$$\mathcal{L}_x = \lambda_1 \mathcal{L}_{x \rightarrow z} + \lambda_2 \mathcal{L}_{x \rightarrow y \rightarrow y} + \lambda_3 \mathcal{L}_{x \rightarrow y \rightarrow z}, \quad \mathcal{L}_{\text{CycleNet}} = \mathcal{L}_x + \mathcal{L}_y$$

Experiments

- Types of tasks: scene level, object type level, object state level.
- Types of evaluation: qualitative and quantitative (image quality, translation quality, translation consistency).

Task Metrics	Image Translation (Scene level, 256 × 256)										Image-to-image (Object level, 256 × 256)					
	HIN	FID ₁₀₀	CLIP ₁₀₀	LPIPS ₁₀₀	PSNR ₁₀₀	SIM ₁₀₀	PSNR ₁₀₀₀	FID ₁₀₀₀	CLIP ₁₀₀₀	PSNR ₁₀₀₀	SIM ₁₀₀₀	L2 ₁₀₀₀	PSNR ₂₀₀₀	SIM ₂₀₀₀	L2 ₂₀₀₀	
EulerNet	113.16	15.85	22.01	8.28	10.27	0.79	12.05	22.08	22.01	0.29	0.70	0.43	1.27	0.07	4.89	
EulerNet-G	130.09	25.43	24.23	9.89	10.27	0.75	12.75	22.28	22.01	0.30	0.71	0.43	1.25	0.07	4.89	
Image2Image	206.96	79.33	111.85	0.51	12.43	0.75	24.73	22.78	22.01	0.14	0.52	0.43	1.25	0.07	4.89	
Image2Image-G	100.83	22.09	30.89	0.22	10.83	0.75	10.93	10.93	10.93	0.14	0.52	0.43	1.25	0.07	4.89	
ControlNet + Canny	108.24	43.26	23.77	0.59	6.05	0.69	12.10	205.73	23.98	0.62	2.27	0.07	4.89			
ControlNet + Canny-G	105.19	57.25	22.94	0.59	10.98	0.69	14.88	205.73	23.98	0.62	10.24	0.07	4.89			
BiVR	131.00	38.73	22.94	0.64	13.02	0.69	15.82	206.06	23.98	0.62	10.05	0.27	2.48			
ESDR	133.08	79.70	22.83	0.57	14.53	0.69	2.85	206.06	23.98	0.62	11.77	0.27	4.05			
SDRN	311.93	22.03	0.57	16.22	0.36	0.71	237.44	0.71	0.67	11.31	0.57	0.07	4.89			
PaPer-Zero	106.91	52.38	20.79	0.57	10.84	0.69	17.73	205.67	23.98	0.62	17.28	0.41	1.66			
PaPaper-Zero-G	41.17	25.31	0.57	9.84	13.06	0.71	0.49	205.67	23.98	0.62	20.42	0.41	1.66			

Ablation Study

An ablation study on the role of



Diversity and Generality



Quantitative Examples



Limitations and Future Work

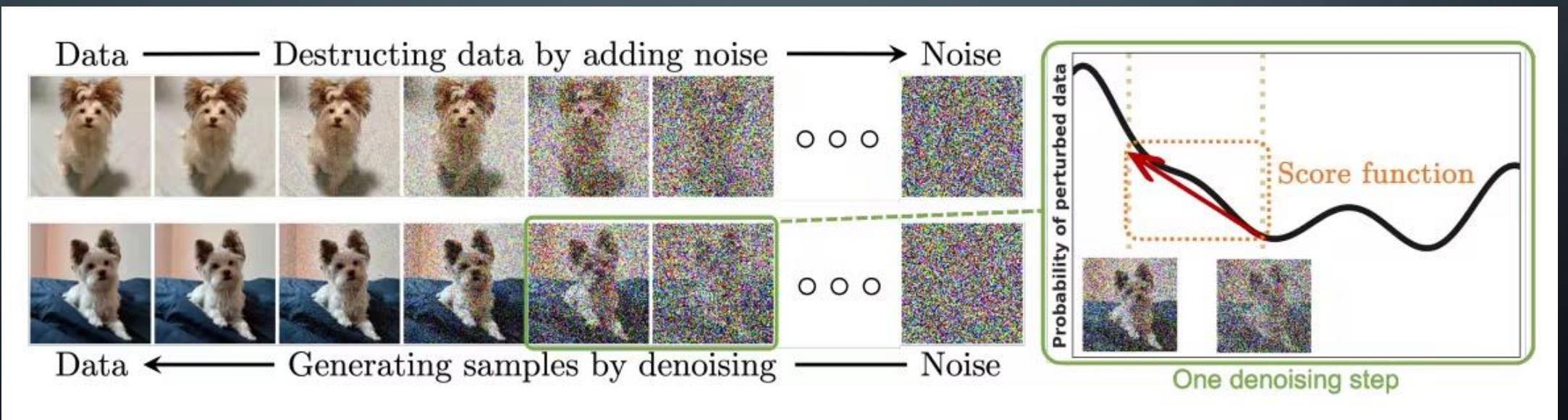


NEURIPS REPORT

- Diffusion Models
- Cycle Consistency
- Fine-tune pre-trained model

NEURIPS REPORT

- The Emergence of Reproducibility and Consistency in Diffusion Models



NEURIPS REPORT

- Diffusion Models Creative Track (Video)

A photograph of two men in a forest setting. The man on the left has a beard and is wearing large black headphones and glasses. The man on the right has a beard and is wearing blue headphones and a brown and white jacket. They are both smiling. There are white circuit board patterns overlaid on the left side of the image.

NEURIPS REPORT

- Krokodile Dandies

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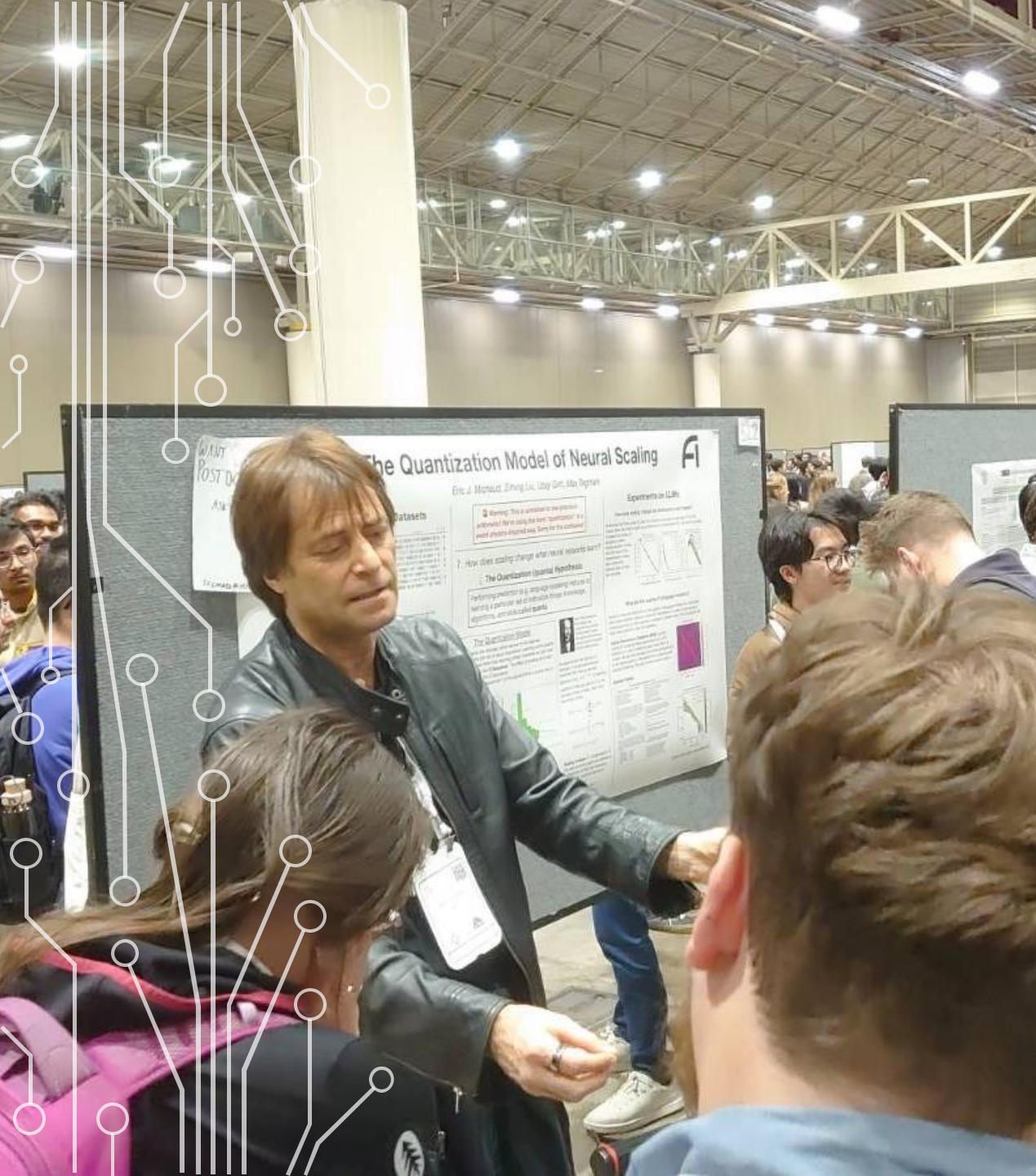


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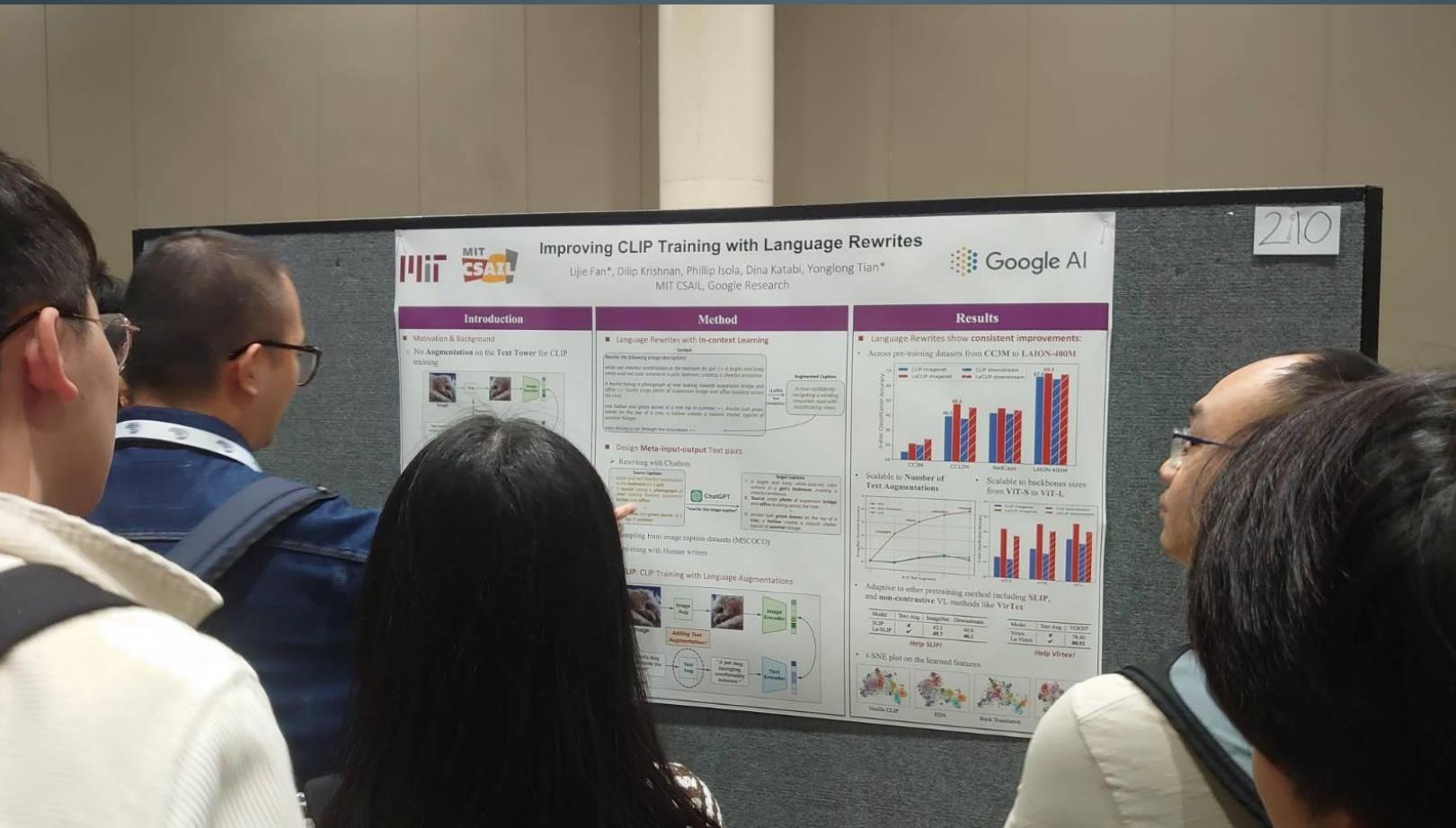




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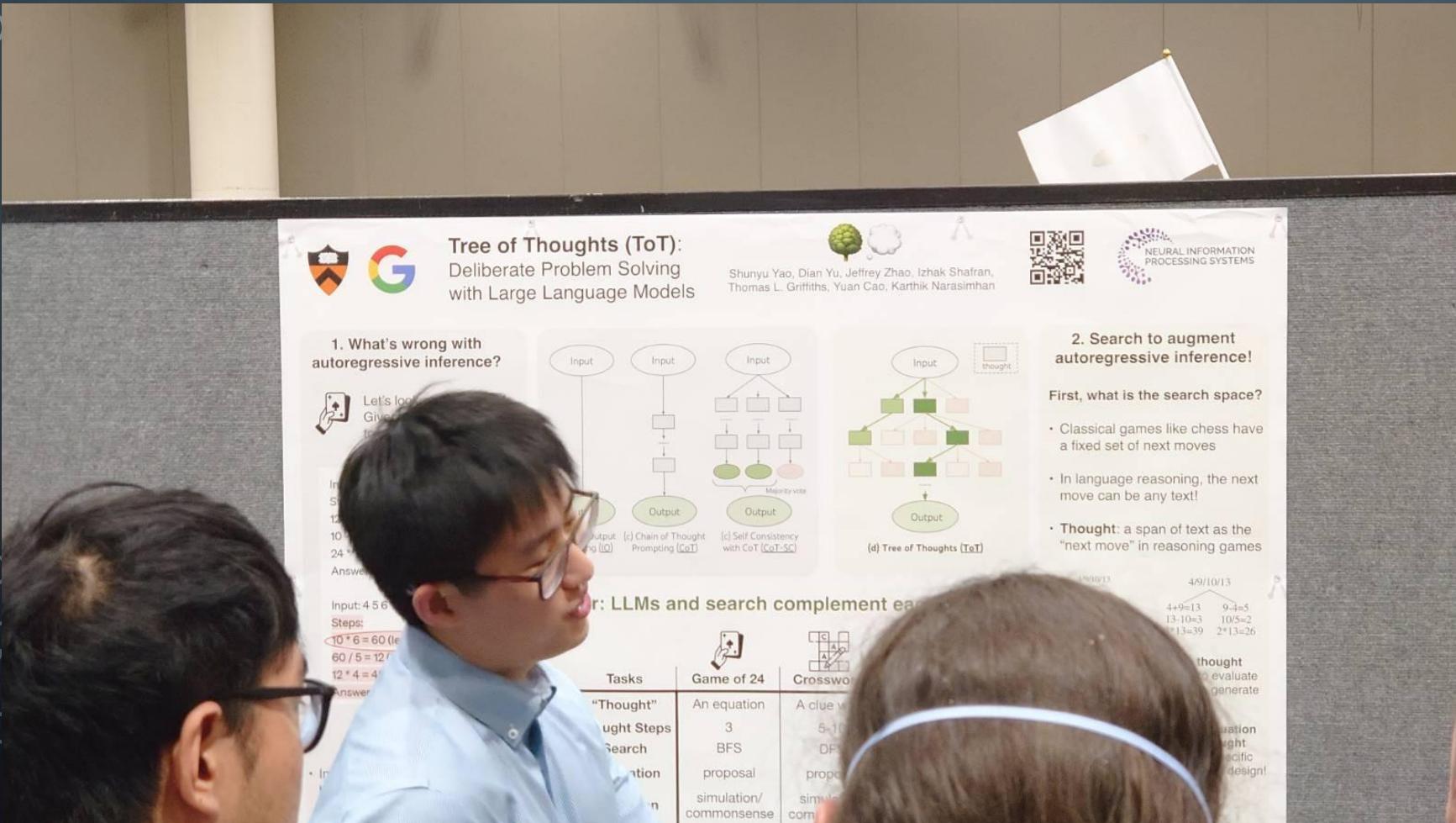
- Max Tegmark

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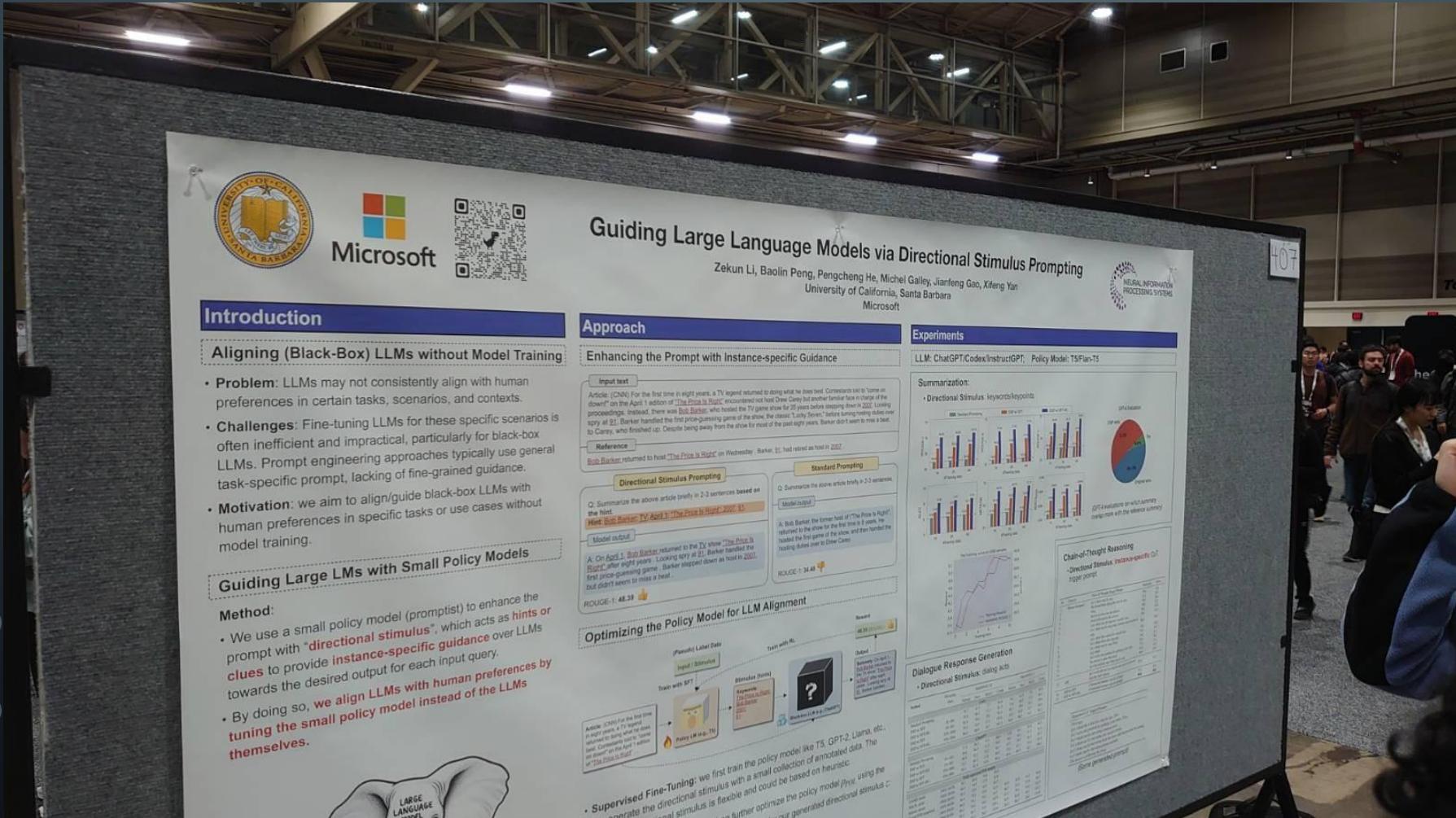
- Diffusion Models + LLMs
- Create text variations

NEURIPS REPORT



- LLMs
- Tree of Thoughts
- 287 Citations

NEURIPS REPORT



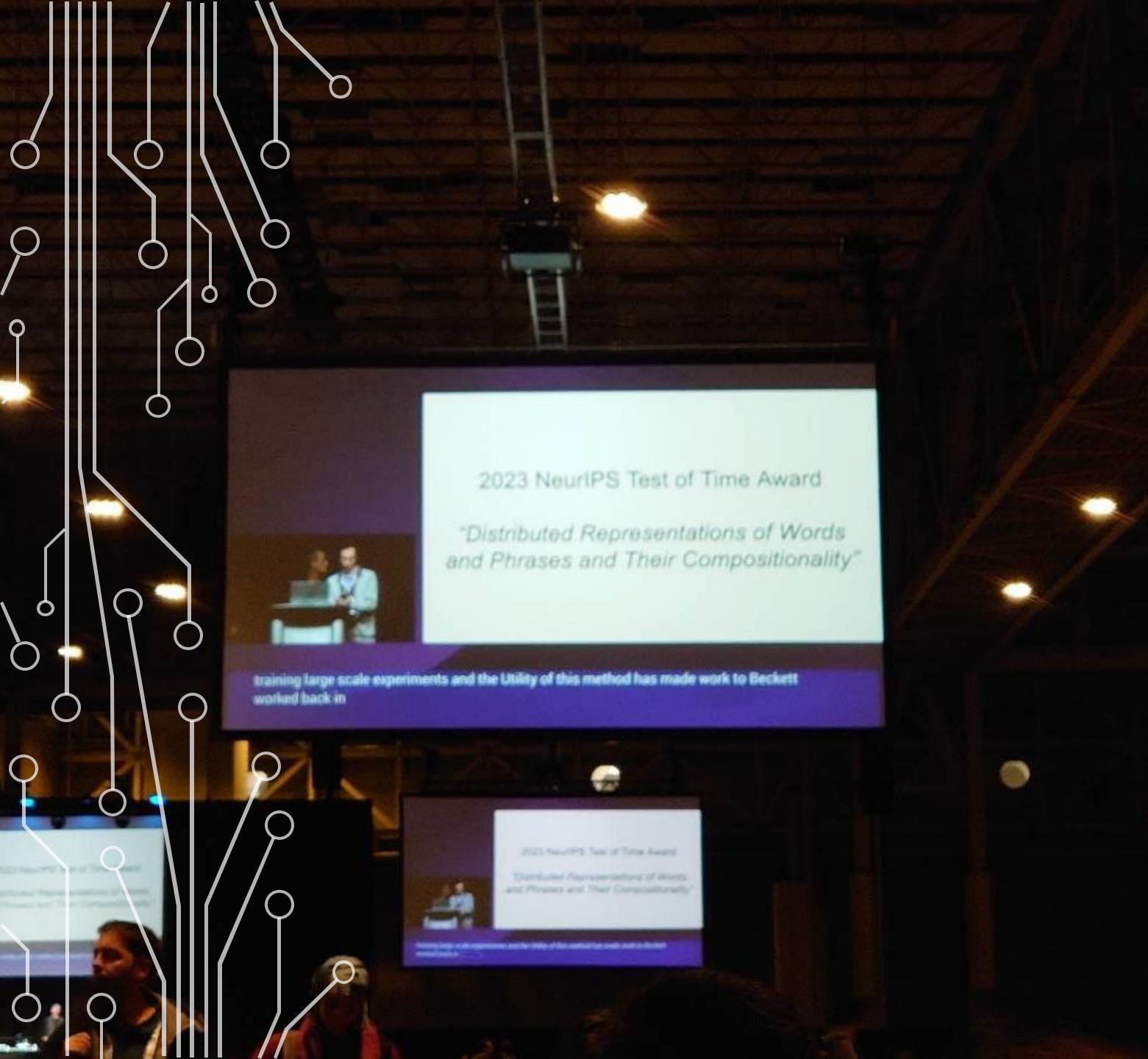
- Use small policy model to create prompts for LLM guidance

NEURIPS REPORT – LLM NEWS

- Cascading Alignment Strategy
- Christmas bias of ChatGPT

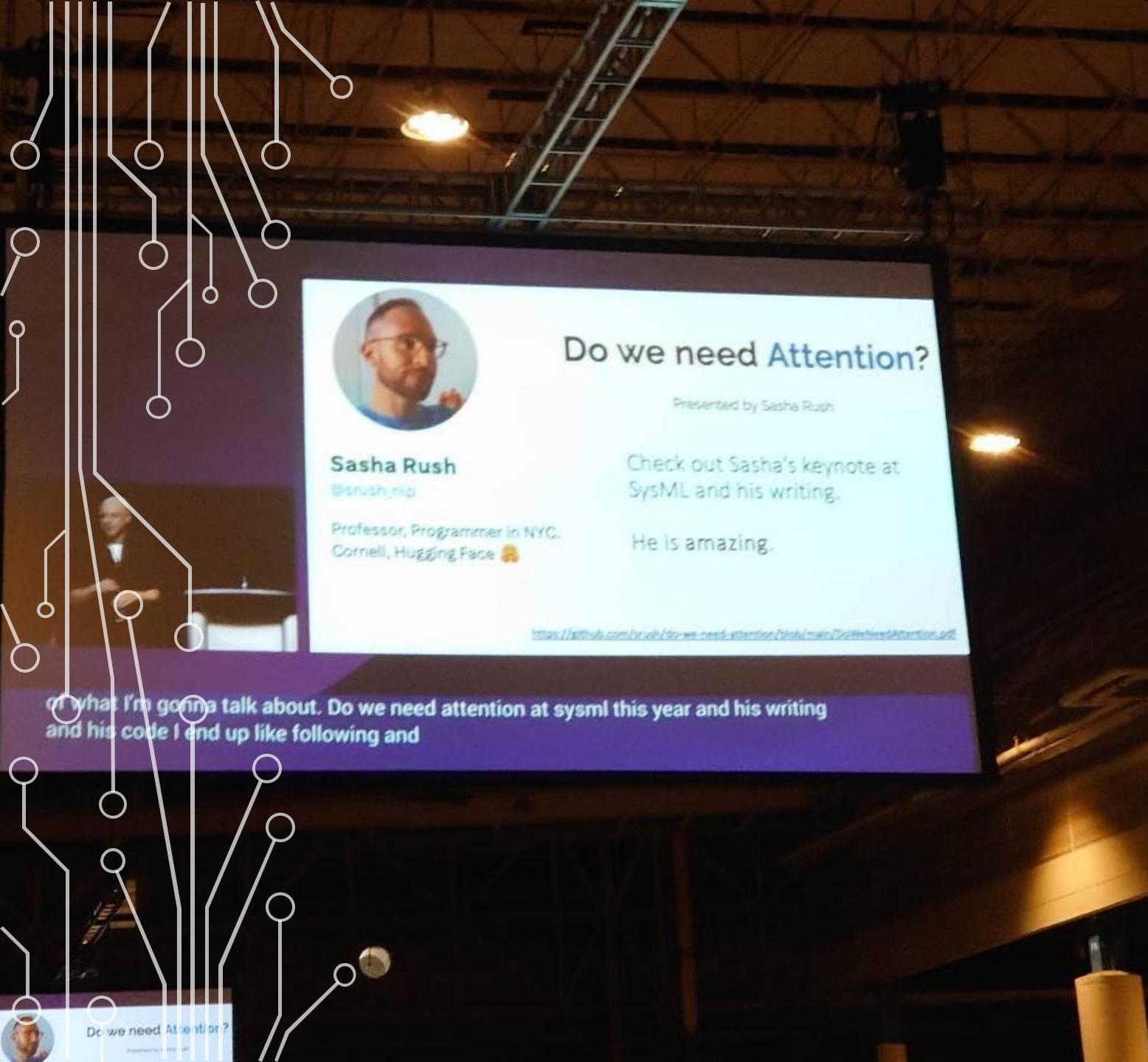
NEURIPS REPORT

- Test of Time Award
- 41831 Citations



NEURIPS REPORT

- State-space Models

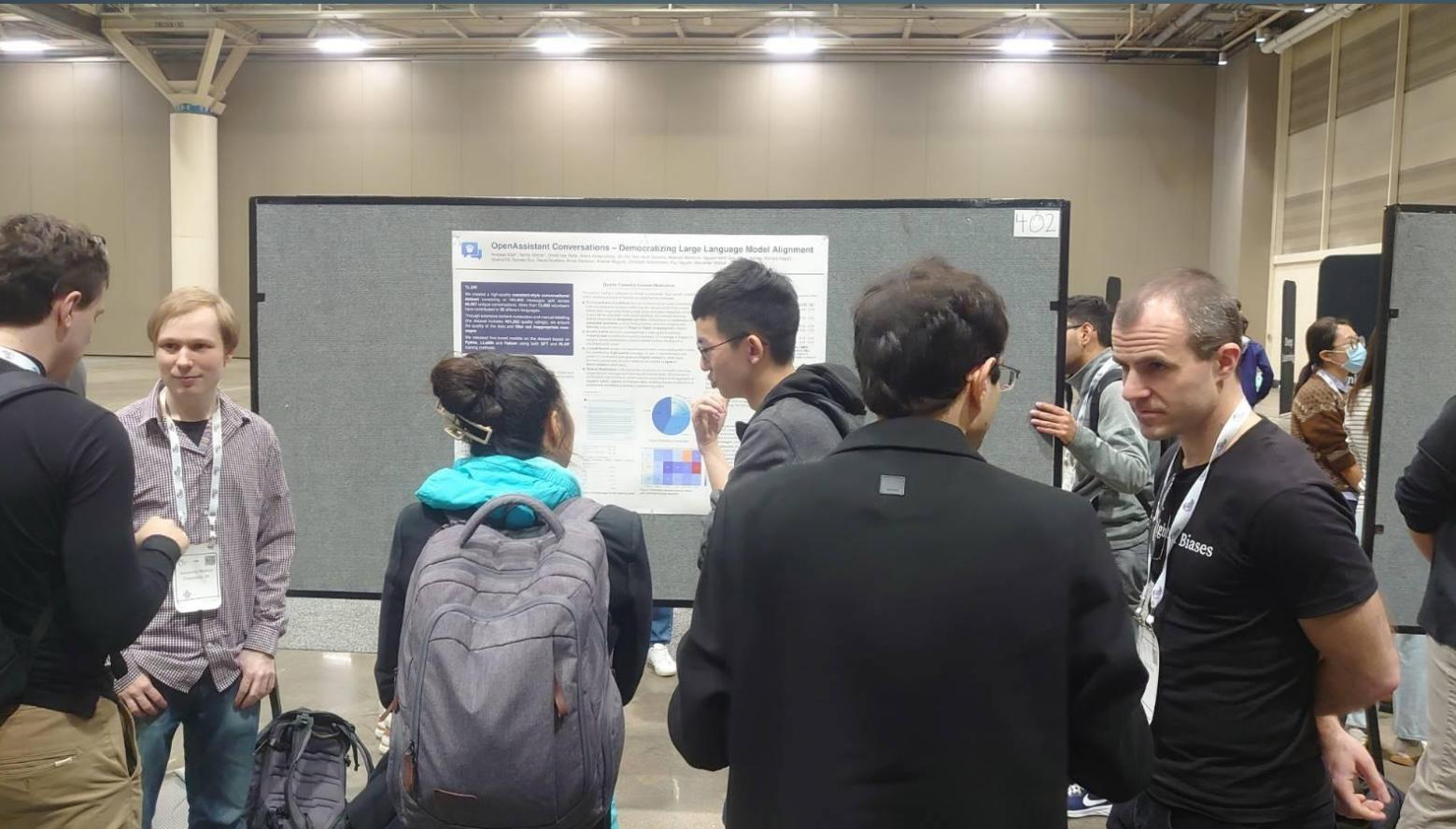


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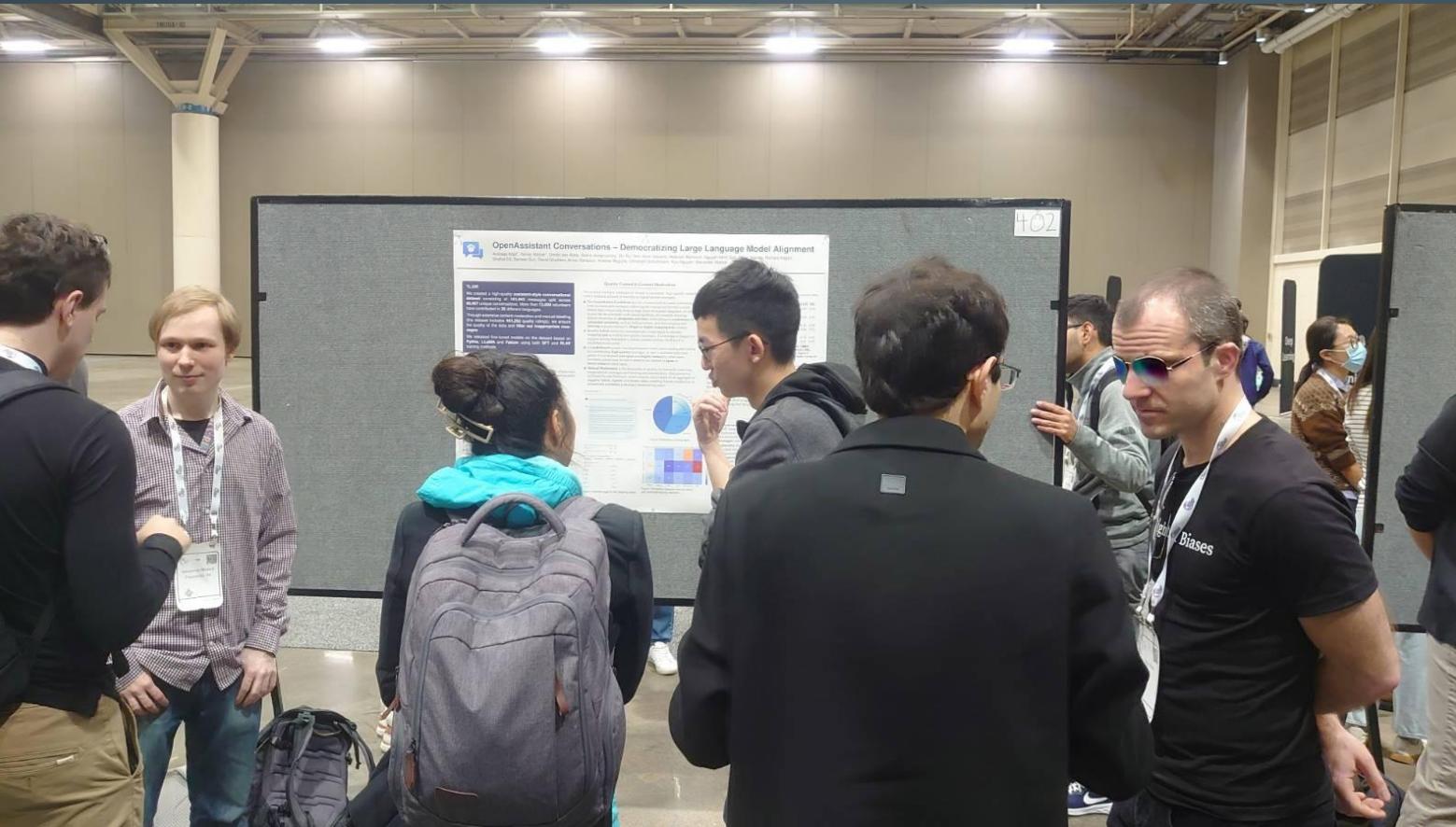
(Vids)

NEURIPS REPORT



- Yannick Kilcher
- Open Assistant

NEURIPS REPORT



- Yannick Kilcher
- Open Assistant

NEURIPS REPORT

- Representation Learning?
- Implicit Contrastive Representation Learning with Guided Stop-gradient

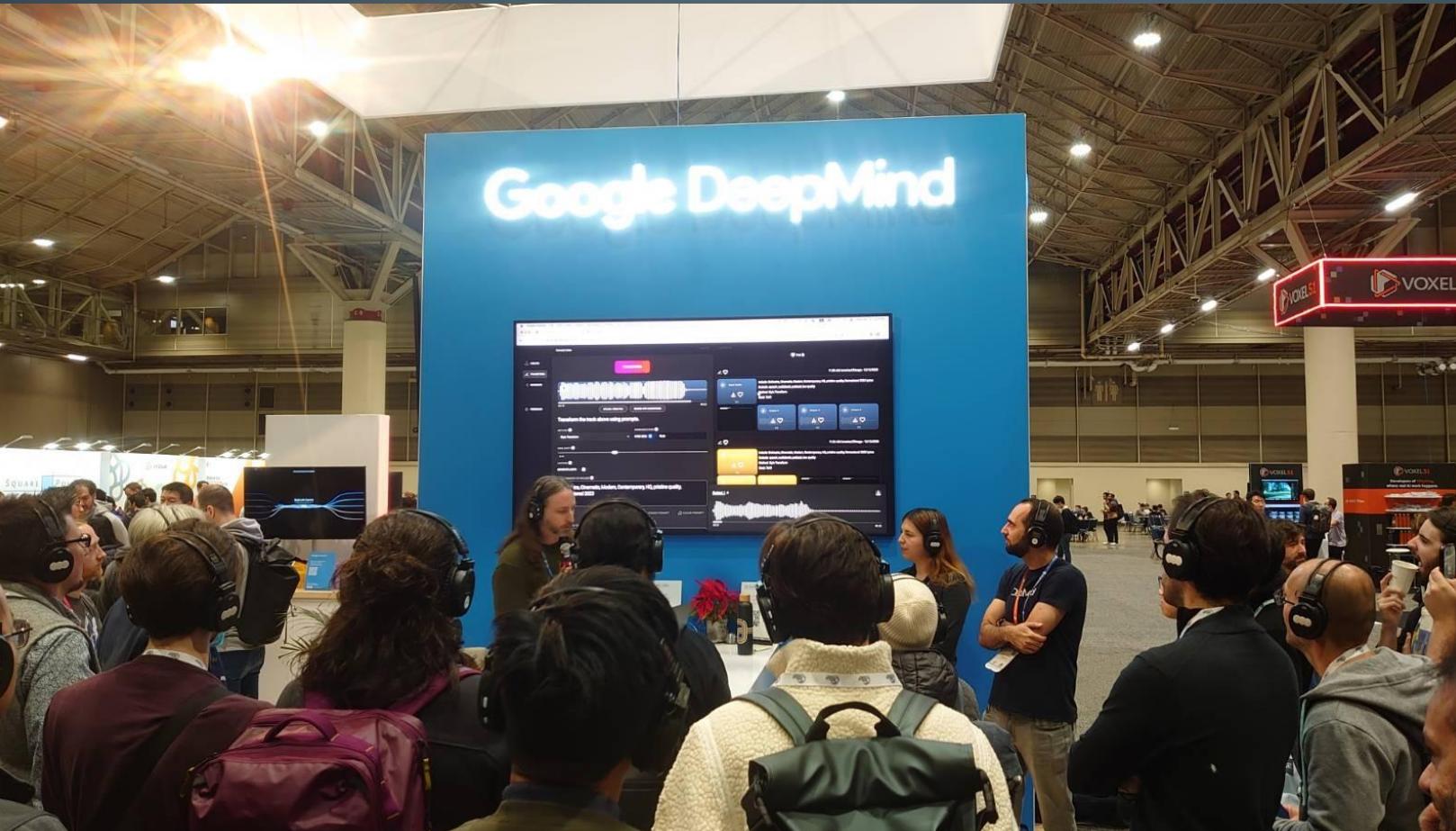
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- Music Meetup



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[Magenta's Lyria](#)



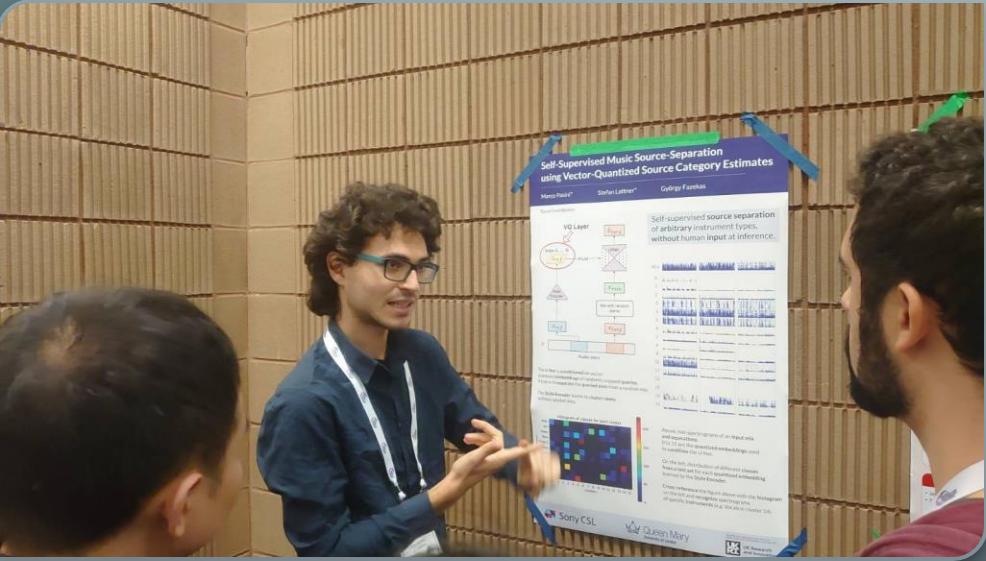


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- Sony Booth
- Presentation Sony TechHub

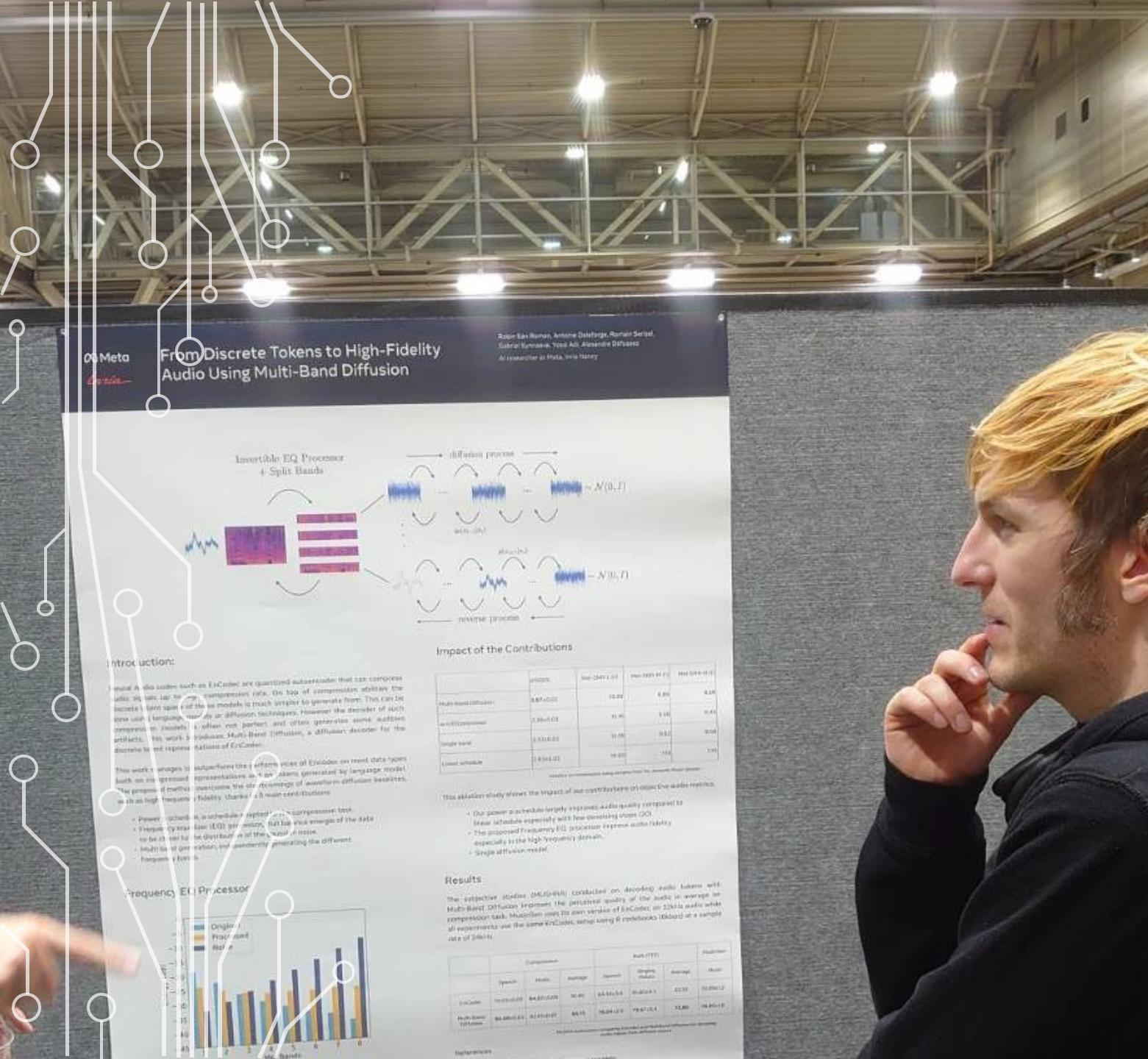
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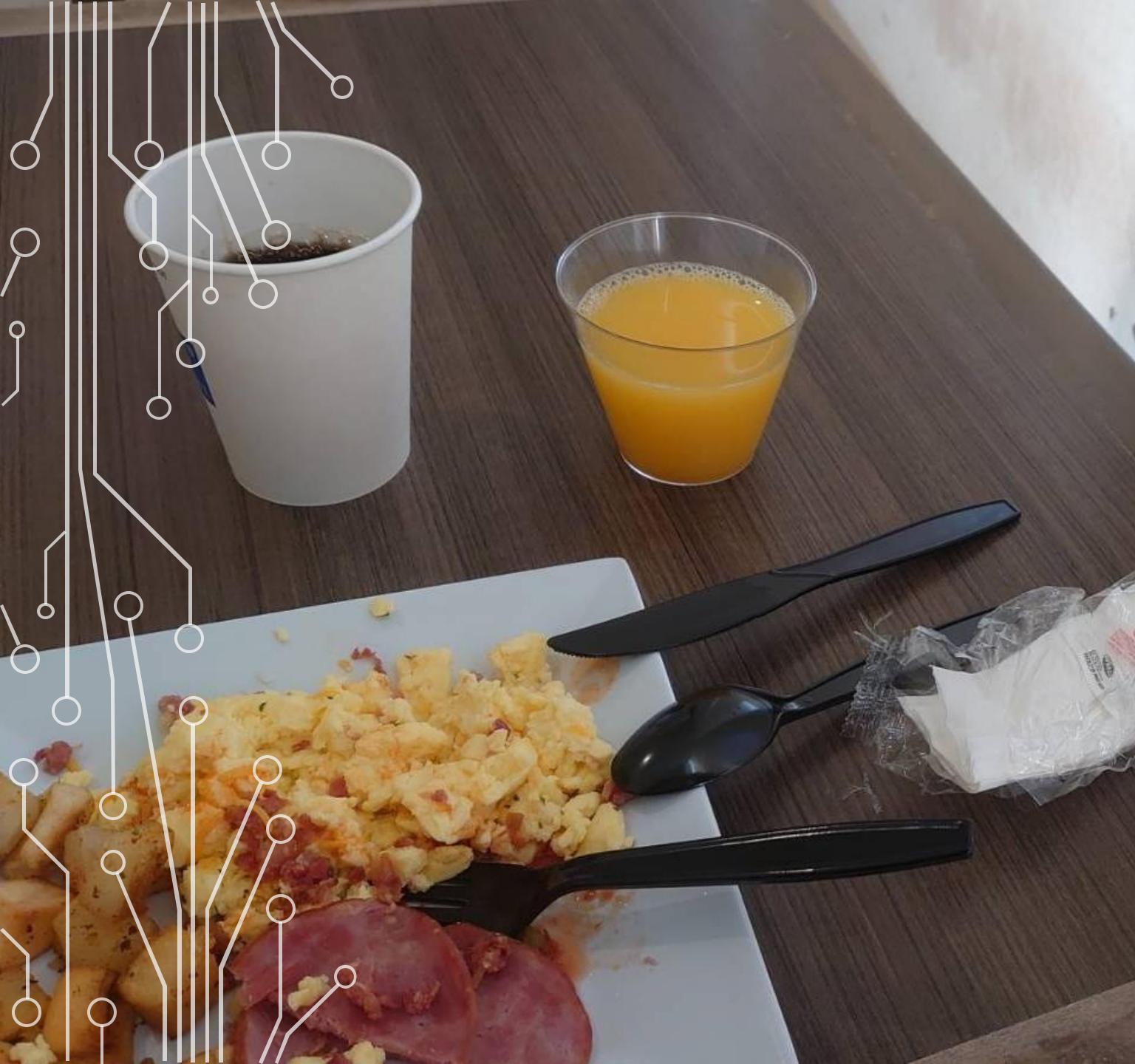
- Marco Pasini at his poster



NEURIPS REPORT

- CJ Carr Dadabots
- Stability AI Music Research Leader
- Stable Audio





NEURIPS REPORT

- Food!?
- Plastik Culture

NEURIPS REPORT



NEURIPS REPORT

- Alligator Sausage





Happy New Year 2024!!